

Passive Soil Vapor Extraction

An inexpensive way to remove underground contaminants

Passive Soil Vapor Extraction (PSVE) removes underground contaminants by enhancing the natural “breathing” that occurs in soil in response to changes in atmospheric pressure. The process is a low-cost complement to conventional active-extraction methods; investment and maintenance are low and no power is needed. The passive process is better suited than conventional methods for certain problems in cleaning up volatile organic compounds (VOCs), such as at the margins of plumes and for removing residual contaminants after active-extraction methods are inefficient.

Flow pathways are controlled

The PSVE concept is relatively new. Recent improvements in subsurface pressure monitoring (at depths to 60 meters) reveal that atmospheric pressure changes as small as one millibar are transmitted to that depth and cause bulk advection of air through macropores in the soil vadose zone (above the water table). The key to PSVE is to manipulate natural forces to remedi-

APPLICATIONS

- Low-cost “polishing tool” following active VOC extraction
- Contaminant extraction at the margins of underground plumes
- All types of contaminant VOC extraction in the vadose zone

ate contaminated areas by using knowledge of the pressure relations between the surface and the subsurface.

This can be used to accurately install pathways, such as wells and pipe collection networks, to achieve optimum flow. The flow through these pathways can then be controlled by solar-powered microprocessor-operated valving

systems or solar-powered pumping systems.

In wellhead PSVE, air flow results when the surface and subsurface zones are connected by a well. Controls include (1) one-way valves that allow air to escape from the well but force fresh air to sweep through the soil and exit through the well, (2) monitors to determine the contaminant concentration in the escape air, and (3) a stripper or absorber to remove contaminants from the escaping air stream.

If no well is present, the air cycles in and out through the soil surface. In surface PSVE, the surface is modified to control air entry by paving,



Wellhead PSVE system currently being demonstrated at Hanford Area 200 West, Wash.

tiling, or similar barriers. Combining these surface modifications with collection pipe networks can cause contaminated air to move laterally to a collection point for stripping, similar to the wellhead PSVE approach.

Field tests are under way

At three DOE sites, we are studying the dynamics of the PSVE process to optimize removal rate, minimize plume dispersion, and exploit the geology and geometry of each situation.

Availability: We are verifying the technology, exploring licensing options, and looking for industrial partners to participate in the further development and application of the PSVE process.

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